



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/721,075	11/26/2003	Koichiro Tanaka	0756-7223	7829
31780	7590	07/12/2007		
ERIC ROBINSON PMB 955 21010 SOUTHBANK ST. POTOMAC FALLS, VA 20165			EXAMINER ELVE, MARIA ALEXANDRA	
			ART UNIT 1725	PAPER NUMBER
			MAIL DATE 07/12/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

10/721,075

Applicant(s)

TANAKA, KOICHIRO

Examiner

M. Alexandra Elve

Art Unit

1725

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 13 April 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-11,13-20,22-29,31-38,40-47 and 49-54 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-11,13-20,22-29,31-38,40-47 and 49-54 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Specification***

The amendment filed 4/13/07 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: "visible light or shorter wavelength than that of visible light". Applicant has basis in the specification for a "wavelength not more than 830 nm and preferably not more than 780 nm". Visible light ranges from 400 nm to 700 nm; applicant does not have basis for this limitation in the claims.

Applicant is required to cancel the new matter in the reply to this Office Action.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 4-11 & 13-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamazaki et al. (USPN 6,700,096).

Yamazaki et al. ('096) discloses a laser apparatus for manufacturing a semiconductor device using laser irradiation. Two types of lasers may be used, these being, pulse oscillation and continuous oscillation. The semiconductor device has a

semiconductor film formed on an insulating surface. The laser apparatus includes a plurality of laser oscillation apparatuses (102a-102d). The apparatuses may be based on one laser or on a plurality of lasers. Wavelengths may be the same or different. Many types of lasers (pulsed and continuous) may be used, these include: an Ar laser, a Kr laser, YAG laser, a YVO<sub>4</sub> laser, a YLF laser, a YAlO<sub>3</sub> laser, a glass laser, a ruby laser, an alexandrite laser, a Ti:sapphire laser, and a Y<sub>2</sub>O<sub>3</sub> laser. These lasers may be doped with Cr, Nd, Er, Ho, Ce, Co, Ti, Yb or Tm.

The fundamental wave of the laser differs depending on a material to be doped. An example is a laser light having a fundamental wave in the range of 1 $\mu$ m. It is possible to obtain a harmonic wave with respect to the fundamental wave using a nonlinear optical element. For crystallization of an amorphous semiconductor film it is preferable that the second harmonic through the fourth harmonic of a basic wave is applied. Typically, the second harmonic (with a  $\lambda$  of 532 nm) or the third harmonic (with a  $\lambda$  of 355 nm) of an Nd:YVO<sub>4</sub> laser (basic wave of 1064 nm) is applied. A gas laser or a solid-state laser of continuous or pulsed type oscillation may be used.

The laser beam spots may be shaped with an optical system into rectangular shapes, circular shapes, cylindrical shapes, ellipse shapes, slab shapes and so forth. The laser apparatus includes an optical system that is capable of having beam spots oscillated from respective laser oscillation apparatuses to overlap each other on the object to be processed. In addition, the laser apparatus CPU system controls the oscillation of the laser and the stage such that beam spots are corrected placed. Figures 34A-C shows a position control system. As shown in figure 3A the beam spots

of respective laser beams are combined by matching the major axes of respective ellipses and also having the beam spots overlap each other, thereby forming one beam spot. The combined beam spots are irradiated onto a substrate that is being processed. The center axis of the beam spot may be perpendicular to the scanning direction or at an angle of  $45^\circ \pm 35^\circ$ . Figures 5A-B and figures 11A-B show the differing angles that may be used during processing.

The focal distance and incident angle of each lens may be set to obtain desired processing results. The number of cylindrical lenses is not limited and the optical system used is not limited to cylindrical lenses. The optical system is capable of processing the laser beam spot of a laser light oscillated from each laser oscillation apparatus so that there is obtained a shape and energy density suited for the crystallization of a semiconductor film. In addition the optical system combines the beam spots of all laser beams into one beam spot by having the beam spots overlap each other. It is preferable that the laser beam incident angle  $\theta$  satisfies the condition of  $\theta \arctan (W/2d)$  whereby  $W$  is related to the beam spot dimension (short side or long side) and  $d$  is thickness of the transmitting substrate. It is required that each laser beam satisfies this equation/condition before synthesizing.

In one embodiment the silicon nitride film formed using nitride gas is characterized in that there is an absorption peak of N-H association and Si-H association. Thus the apparatus has wavelengths that range in the absorption range.

It is further noted that the absorption coefficient is a property of the substrate and not a structural limitation of the apparatus. A recitation of the intended use of the

Art Unit: 1725

claimed invention must result in a structural difference between the claimed invention (the apparatus, not the workpiece) and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 19-20, 22-29, 31-38 40-47 & 49-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki et al. ('096) as stated above and further in view of Yamazaki et al. (USPN 6,242,292) and Yamazaki (USPN 7,132,375).

Although Yamazaki et al. ('096) discloses absorption with respect to nitriding, absorption specifically with respect to a semiconductor material ( $1 \times 10^4/\text{cm}$  or greater) is not taught.

Yamazaki et al. ('292) discloses that amorphous semiconductor material has a very different absorptance laser energy property than crystalline semiconductor material. In order to obtain a more uniform converted film, a two stage irradiation process is used, as follows: the amorphous portion remaining in the film is crystallized by a first irradiation process, and then the whole crystallization is promoted by a second

irradiation process. By promoting the crystallization moderately, the nonuniformity of stripes occurring on the semiconductor material due to the linear laser irradiation can be suppressed to some degree. Thus, the uniformity of the irradiation effect of the laser light can be remarkably improved and the stripes are made visually relatively inconspicuous.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a laser wavelength based on absorptance because this distinguishes between amorphous and crystalline and yields a more completely converted substrate.

Yamazaki et al. ('292) disclosed absorptance but not the specific values.

Yamazaki ('375) disclose that in the annealing and processing of silicon the absorption coefficient of the amorphous silicon is approximately  $10^3$  to  $10^5/\text{cm}$ .

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the absorption coefficient of approximately  $10^3$  to  $10^5/\text{cm}$ , as taught by Yamazaki ('375) in the Yamazaki et al. ('096) because most semiconductor devices use silicon as an initial substrate.

It is well settled that where patentability is predicted upon a change in a condition of prior art process, such as absorption coefficient ( $1 \times 10^4/\text{cm}$  or greater), the change must be at least "critical", that is, it must lead to a new and unexpected result. Yamazaki ('375) absorption coefficient of approximately  $10^3$  to  $10^5/\text{cm}$  encompasses the claim limitation of  $1 \times 10^4/\text{cm}$  or greater. Thus applicant has the burden of providing proof of criticality. Note *In re Aller* et al. 105 USPQ 223. Absent proof of such criticality in the present instance, it would have been obvious to one of ordinary skill in the art at the

Art Unit: 1725

time of the invention to incorporate the absorption coefficient as taught by Yamazaki ('375) into Yamazaki et al. ('096) process for the purpose of laser irradiating a semiconductor device.

### ***Response to Amendment***

The amendment filed 4/13/07 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: "visible light or shorter wavelength than that of visible light". Applicant has basis in the specification for a "wavelength not more than 830 nm and preferably not more than 780 nm". Visible light ranges from 400 nm to 700 nm; applicant does not have basis for this limitation in the claims.

Applicant is required to cancel the new matter in the reply to this Office Action.

### ***Response to Arguments***

Applicant's arguments filed 4/13/07 have been fully considered but they are not persuasive.

Applicant argues that Yamazaki ('096) cannot be used as 102(b) prior art because it was published after the US filing date. The examiner respectfully notes that no statement of common assignee or common inventorship is contained within the



application. Furthermore, the filing date of Yamazaki ('096) is 10/25/02 which predates applicant's filing date of 11/26/03. also, the Office has received no certified translation of the JP 2002-349007. In addition, if the 102(e) requirements are meet, the prior art still has merit based on 102(a).

Applicant argues that beam overlap is not taught. The examiner respectfully disagrees because Yamazaki et al. ('096) states in addition the optical system combines the beam spots of all laser beams into one beam spot by having the beam spots overlap each other.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

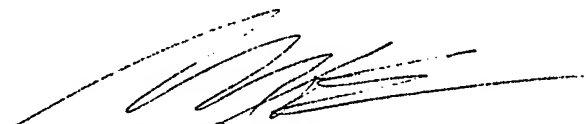
Art Unit: 1725

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Alexandra Elve whose telephone number is 571-272-1173. The examiner can normally be reached on 6:30-3:00 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jonathan Johnson can be reached on 571-272-1177. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

July 8, 2007.



M. Alexandra Elve  
Primary Examiner 1725